

# **The Expansion of Explosives Safety Education for the 21st Century**

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- Introduction
- Explosive Engineers are engineers in the military and non-military mining engineers, civil engineers, geotechnical engineers, explosives research and testing engineers, demolition engineers, and product development engineers as well as other kinds of engineers.

- *Individual Blast Photo* category winner.
- Implosionworld.com; demolition of a bridge on the Ohio turnpike, 2003.





- Currently, the number of experienced explosives engineers is decreasing and according to the U.S. Department of Labor by 2014 explosives workers in mining alone will have decreased by about 15%.
  - Dept of Labor; <http://www.dol.gov/>
- This situation is not limited to mining but extends to manufacturing, packaging, and transportation of explosives, testing, research as well as national defense.
- The need for professionals in explosives engineering is also growing in construction trades and urban redevelopment. Vibration and air blasts from these operations are now closer to residential areas and require monitoring and data evaluation by skilled workers. In addition, the design of blasting rounds for these operations requires engineers with extensive explosives training.
- In other words the need for explosive engineers and explosive workers over the next 15-20 years will be critical.



- Additionally,
  - 1. We need workers who can describe and explain explosives to the K-12 school age children. This is a safety concern and an educational concern.
  - 2. We need workers who can act as liaison with the general public bringing them information instead of inflammatory content. This would be a good project for college-age people who could contact both the younger people and the adults in a community. This is a safety concern and community concern.
  - 3. We need workers who can train adults and children about pyrotechnics and the safety concerned with pyrotechnics.



- Many explosive professionals are now reaching retirement age, 50 to 70. They are the ones who have years of experience and could pass their knowledge on to the less experienced workers.

• Photo: Abo canyon railroad widening project, 2009, EMRTC.



- Steps to Explosives Engineering
- Precollege
  - Applied training, explosives camp, internships.
- College
  - Internship during summers and research projects during the school year and summers
- Graduate School
  - Research and M.S. or Ph.D. degrees



- Precollege
- Explosive Camp for sixteen and seventeen year olds
  - Safety lectures each day and at the sites of explosive handling.
  - Car bomb, shape charges, explosive welding, thermite reaction
  - Sensitivity testing: drop hammer, electrospark discharge, friction
  - Physics of explosives, history of explosives, energetics in civil engineering, energetic effects on structures, retrofit of structures
  - Field trip to blasting site
  - Chemistry laboratory instrumentation analysis, combustion synthesis, synthesis and analysis of explosives



- Precollege
- Precollege 16 and 17 year olds at the explosives camp at EMRTC help set up the day's blast.
- All students worked hand-in-hand with ordnance professionals and professors to learn about applied and theoretical explosives' engineering.

• Students at Abo canyon railroad widening project, EMRTC, 2009.



- Precollege explosives camp 2009





- College
  - Bachelor's in Mineral Engineering with explosives concentration
  - Bachelor's in Mechanical Engineering with explosives concentration
  - Bachelor's in Chemistry
  - Bachelor's in Chemical Engineering







- Graduate School
- M.S. in Materials Engineering with concentration in explosives
- Ph.D. in Materials Engineering with concentration in explosives
- M.S. in Mechanical Engineering with concentration in explosives
- M.S. in Mineral Engineering with concentration in explosives





- Jobs for Explosive Professionals...A real job.
- Explosive deslaggers for the power industry; deslagg smoke stacks and exhaust ports
- Accident and safety experts for explosives
- Federal Bureau of Investigation (FBI) technicians and local bomb squad disposal technicians
- Investigators, agents, and technical personnel for Alcohol, Tobacco and Firearms (ATF)
- Phytoremediation workers use plants to remove explosives from soil and render the explosives harmless
- Sales of explosives detection devices sold to police, military, and private individuals
- Military ordnance personnel in career path or part-time service

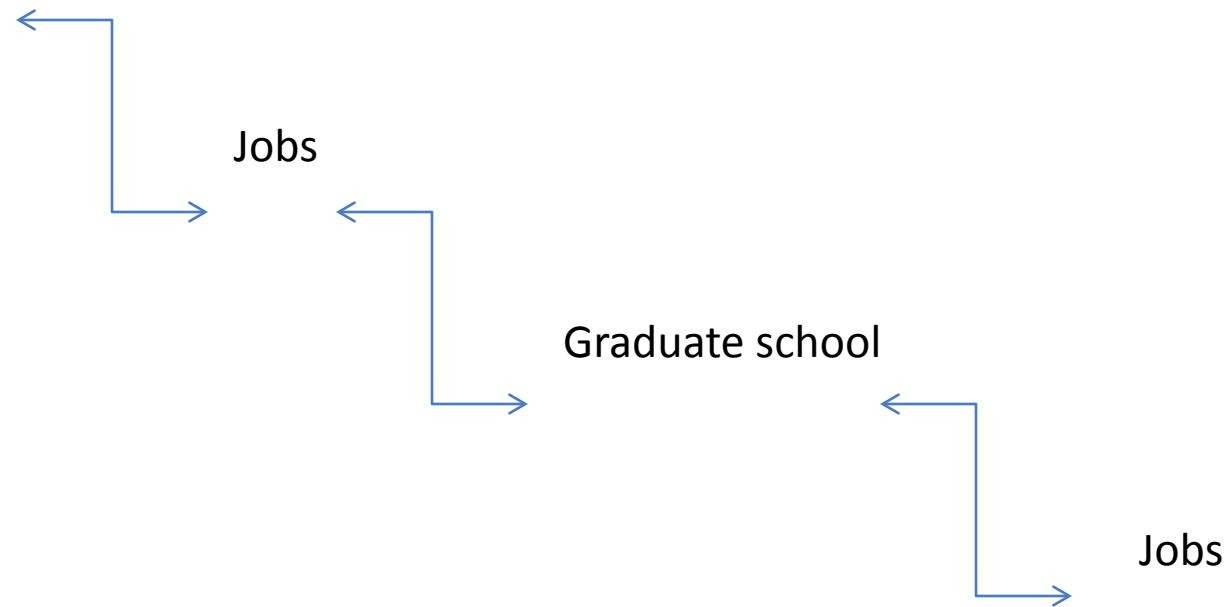


- **Blasters, Explosive Workers, Ordnance Workers**
  - Place and detonate explosives to demolish structures or to loosen, remove, or displace earth, rock, or other materials. May perform specialized handling, storage, and accounting procedures. Includes seismograph shooters. Excludes earth drillers, except oil and gas who may also work with explosives.
  - Department of Labor , [http://webapps.dol.gov/search/?search\\_term=explosives+workers/AdvSearch.aspx](http://webapps.dol.gov/search/?search_term=explosives+workers/AdvSearch.aspx)
- **Loggers and Extraction Workers**
  - Explosives may be used by loggers for clearing obstacles including rocks and roots structures.
  - Department of Labor , [http://webapps.dol.gov/search/?search\\_term=explosives+workers/AdvSearch.aspx](http://webapps.dol.gov/search/?search_term=explosives+workers/AdvSearch.aspx)
- **First Responders and Emergency Preparedness Workers**
  - First responders are the fire department, emergency medical personnel and other personnel who respond to an explosive device detonation.
  - Health and safety plans (HASP) should include protocols for first responders responding to terrorist event recognizing the possibility that secondary explosive devices may be used at the scene as well as primary explosive devices.
  - Department of Labor, OSHA <http://www.osha.gov/SLTC/emergencypreparedness/guides/secondary.html>



- Career Pathways

Student in College





- Some jobs that are available as of June 2010:
  - Explosive ordinance disposal
  - Explosive detection – dog handler
  - Finisher, explosive plant handler
  - Homemade Explosive (HME) Ordnance Disposal (EOD) Technician
  - Squib explosives expert
  - Explosives supervisor/ISD718
  - Training administrator; joint Improvised **Explosive** Device Defeat Organization (JIEDD - Arlington, Virginia)
- **And of course listed under explosives workers, jobs ....**
- “Explosive wax employment; European Wax Center - Orlando, FL European Wax Center – Waterford Lakes is now hiring Licensed Estheticians for our Grand Opening! We have part time and full time positions available for... \$30,000 - \$60,000 a year .”
- The Terrorist Detection Technologies and their markets alone are worth \$4 billion as of this year. There are jobs for everyone who wants a job. That's just the detection markets.



## • What we need to do...

- Let older workers prepare information and inform less experienced workers through seminars and work experience.
- Help retired workers provide their expertise to less experienced workers by paying them to teach classes or mentor one-to-one.
- Encourage and pay for explosives safety schooling for all workers.
- Mature workers can add to their knowledge through classroom and applied instruction.
- Help young people make a commitment to explosives as a career by participating in organizations like ISEE and other trade organizations.
- Encourage the military to train more explosives engineers and experts at explosive handling.
- Work closely with academics to provide the training that gives the best of applied and classroom instruction.
- Provide classroom experience and laboratory experience that leads to competence in the workplace and in the field.